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ABSTRACT

Open classrooms, embodying an educational policy and a setting departing from the traditional is said to provide especially good opportunities for environmental studies. An approach that summarizes a wide range of information on specific classes is a beginning to gathering environmental information useful to the deisgn process. This information includes what the room is like, the users and where they are located, and what they are doing and with whom. Each piece of information can be viewed in the context of a long-range and detailed backlog of data. Two urban elementary schools using open classrooms have been participating in a two year study of space use and behavior. Both operate a program using children's interests and a flexible use of space and learning materials. In order to provide the detailed information necessary for understanding how space is used, eight classes, four in each school, were selected for intensive study. Specific data gathering techniques included repeated observations of classrooms, repeated tracking, that is, following the complete days of individual children, interviews with teachers, children and parents, and the use of a model of the classroom in conjunction with an interview with students. A series of environmental workshops were also held with teachers and some children. This report concentrates on observations. (Author/JM)

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DESIGN IMPLICATIONS OF SPACE USE AND PHYSICAL ARRANGEMENTS IN OPEN EDUCATION CLASSES

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The increasing use of open design settings in offices, homes and schools, among other places raises critical issues regarding the meaning and consequences of this approach to space. Clearly, the motives of planners or users that lead to the decision to use this type of arrangement are varied. Some are based on convictions growing from specific philosophic orientations, some aimed toward achieving a particular look or image, others to improve supervision, surveillance or even safety, and still others to magnify the impression of spatiousness. The striving today for openness whatever the setting, may also reflect the increasing scarcity of space as a shared resource and the very real closing in of modern life.

For the school, the trend toward openness has been tied in historically with the British open classroom movement. Increasing numbers of school systems in this country have embraced the idea of open classes and/or open spaces as a solution to a variety of educational problems. Mixed motives certainly underlie these choices so that partialling out the design component from the educational becomes a very difficult task. Yet, it is our feeling that it is critically important to understand the specific goals before considering whether the physical context and educational process complement each other.

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Environments are often described as supporting, facilitating or obstructing activities within them. Since open classrooms embody both an educational policy and a setting that departs from traditional forms, they provide especially good opportunities for environmental studies. In what way can we look at open classrooms and gather environmental information that is useful

to the design process? An approach that summarizes a wide range of information on specific classes, where it is possible to take a long and close look at these classes over time appears, from our view to provide a most fruitful beginning. This information includes what the room is like, the users and where they are located, what they are doing and with whom, and all of this over the natural course of time (in the case of a classroom over the academic year). Each piece of information can be viewed in the context of a long-range and detailed backlog of data.

Our work has taken place in two elementary schools using open classroom approaches. These schools have been participating in a two year study of space use and behavior. Both schools are located in a large urban area. Both occupy old, traditional-design buildings and each has a student body from varied backgrounds. School A is an experimental school with 400 children, offered to parents as an educational alternative to existing local schools. School B is a larger facility of about 1250 students contained in a single building with an attached annex. The approach to open classroom techniques in both schools involves a program using children's interests and a flexible use of space and learning materials. Although the rooms were structurally intact, each had physical arrangements of furniture and equipment to divide the room, create special areas and provide a variety of working spaces (see Figures for typical rooms). The rooms were made up of many elements, none specifically mandated, and from the school's view, capable of being placed in any of a variety of arrangements. Within rough limits of fire regulations and safety codes, teachers were free to reorganize space, build or acquire furnishings, and change them at any time. In fact, each of our rooms was different, reflecting the teacher's conceptions of what

the setting should be.

In order to provide the detailed information necessary for understanding how space is used, eight classes, four in each school, were selected for intensive study. Class size was about 30 students. In the first school (School A) efforts were concentrated in one mini-school which consisted of four classes located on one floor of the school. The inter-aged classes contained groupings covering a kindergarten-1st grade, a second-third grade, a second-third-fourth grade and a third-fourth-fifth grade. Rooms varied in size from 594 to 1035 square feet. In the second school (School B) four classes in one wing of the school were selected. These consisted of three second grade classes and one first grade class, with rooms ranging from 864 to 900 square feet. Our selections were made from a group of teachers who expressed a desire to work with us. Our criteria essentially were to choose cooperative teachers in proximal rooms in order to enable our research staff to make frequent observations.

Gathering Relevant Data

The specific techniques that were used included repeated observations of classrooms, repeated tracking, that is, following the complete days of individual children, interviews with teachers, children and parents, and the use of a model of the classroom in conjunction with an interview with students. In addition, a series of environmental workshops were also held with teachers and some children. This report will concentrate on our observations, using the other data when relevant to the discussion.

The observations of classrooms took two different forms. One set, the furniture mapping, traced the location of furniture and equipment in each classroom over the school year. Directed to the simple question of what these potentially changeable rooms were like, over the year, the observer recorded

the type, magnitude and location of changes within the rooms. Using a grid which divided the floor plan of the rooms into twelve equal sectors, the physical elements were observed and coded bi-weekly. This involved plotting the specific location of the furniture and the functional areas so that changes over time could be considered. The grids were analyzed to identify functional areas, addition and removal of pieces, new combinations and transpositions, and shifting and rotation of pieces both within and between functional areas.

The second set of observations concentrated on people within the room. The specific method was behavioral mapping, a standardized, naturalistic time sample technique for quantifying and describing behavior patterns and use of physical space. For each school a detailed floor plan was made of the study sites (classrooms, corridors, ancilliary rooms). The twelve sector grid used for the furniture arrangement phase of our work provided the divisions within the rooms. Since each classroom was divided in such a way that sector number 1 was the far corner and sector number 12 generally the area of the door, it was possible to compare similar portions of each of the rooms. Preparation of the observation instrument involved compilation of an exhaustive list of coded classroom activities and materials. The observations identified the activity in each sector of the room, including number of participants, teachers, visitors, male or female students, specific sector (1 through 12) location within sector (center, edge, corner), and materials and equipment in use. The form provided room for comments for each activity observed. The specific format involved a tour of all areas to be observed every 30 minutes using a predetermined sequence. Prior to mapping an observer handbook with complete instructions was prepared. Three observers were trained in the mapping procedure until adequate reliabilities were

obtained.

Observations took place at three points during the school year, in October, January and May of 1973-1974, and are continuing into the present year. An essential component of behavioral mapping, and in fact all of our observational information is that the observers get sufficiently close to ongoing activity to pick up necessary detail without disturbing the flow of activity. It is very important, therefore, that members of the research staff at the very least, become familiar visitors to the classes being studied. In fact, preparation of the observation forms and training of observers provided much of that opportunity. By the time data were recorded, there was some assurance that the presence of the observer did not intrude on class routine to a noticeable extent.

Data on Furniture Arrangements

The classroom arrangements remained quite stable over the academic year. Changes were infrequent, generally involving pieces of furniture that were easiest to move, that is, a desk or a small round table. Desk and chair arrangements remained intact as did particular interest areas (math, science, library). Indications of the essential stability were reflected in the minimal changes in the position of the teacher's desk and of the major seating areas in each room. Of the seven rooms in which there were teacher's desks, six remained in the same grid sector the entire year. The one exception was a single change in a room in order to accommodate the addition of a loft.

It will be very important to consider the rather stable physical arrangements in light of the patterns of use in these rooms over the school year.

Data on Patterns of Use

In order to get some sense of what is happening within the classrooms it is possible to look at the distribution of children across the twelve sectors of each room. Over the school year, none of the rooms had what might be considered to be an even distribution of use. In the most extreme cases, two classes in School A and one class in School B, half the total number of persons observed were in two sectors of the room, that is, in one-sixth of the total area (See Figures 3 and 4). It must be added that in many cases this resulted from group meetings, but clearly the frequency of this phenomenon represents a concentration of children beyond what might be expected in light of the choices offered by the educational philosophy of open classrooms. In some rooms the uneven use reached rather dramatic levels. In one case, of the total persons observed, 45% were identified in one sector, with 9% or less found in each of the remaining sectors. All of the classes had at least one sector with twice the expected number of persons, that is, 16% or more. Only one room, on its second mapping, revealed less than 16% in every sector. However, this instance illustrates the value of bringing additional information to a specific comparison. Although children in this particular class were not concentrated in one area, they were often involved in a group lesson wherever they happened to be. This type of lesson was common in two of the classrooms. Children kept stable seats in which they did their assigned work and from which they listened to lessons. In the other rooms the heavily used sectors were areas free from furniture in which group meetings were held.

It is possible to note a kind of linking effect, that is, the tendency for an area in which density peaked to be adjacent to other heavily used areas. At times the sectors with over 10% of the total activity joined to create dense zones. Findings also indicate that corridor space and ancillary rooms

received rather limited use.

The question of what went on in these sectors of the classrooms adds another piece of information essential to understanding room use and distribution of occupants. When we consider activities observed in the two schools, there were interesting similarities and differences (see Table 1). For School B, writing was consistently most frequently observed over the year accounting for at least one-fifth of the activities. Talking and arts and crafts occupied the next two ranks. In the case of School A, writing was most frequently observed at the beginning, with talking in the first place the remainder of the term. None of these, however, reached the level of the predominant activity in School B.

In School B, three activities constituted 47 to 50% of all observed behavior, while in School A it is necessary to consider four or even five (in the case of the second mapping) to reach that level. This apparently reflects a different program emphasis, with greater variety revealed in School A. While there was a tendency for writing to decrease over the year for School A, it remained fairly stable for School B. Talking took a different pattern, rising in rank between first and second observations. For School B this rise was followed by a leveling off in the final mapping where it remained second in rank but represented a smaller percentage of the total activities observed. For School A, talking rose from second place to first by midyear but the total percent increased somewhat in the final mapping. One may question whether the relative stability of the room arrangements reflects the changes in the activity patterns.

Most interesting is the finding that the overall patterns of activities in the two schools paralleled each other to a considerable degree. We find this despite the fact that they were quite different in organization and

that they seemed, at least on the surface, to have different conceptions of open settings. School B appeared more structured while School A, offered to parents as an education alternative for their children, would seem to have been more innovative. In fact, although there was greater variety in School A, much of the same activity took place in both places. The activities coded as "working" included a variety of behaviors dealing with materials, mainly math or science. This type of activity is frequently viewed as desirable in open education settings since it involves learning through manipulation of tangible objects that support the more abstract type of learning. However, in both schools it rarely reached much more than 6% of the total activity observed.

It is useful to examine individual class patterns against the background of data for schools. In some classes activities were more evenly distributed than in others. In others, a single activity dominated, suggesting a specific program emphasis. This was especially true of two classes, one in each school where writing reached over 30% of total observed activity in the first mapping. Later, this leveled off with other activities increasing, suggesting less directed activity as the school year progressed. Interestingly, the change in activity emphasis was not reflected in supportive room changes.

The ranked data provide other interesting comparisons. For a classroom of School A (see Table 2), the initial mapping revealed a peaking of writing at 32% with all other observed behavior reaching less than 10%. Writing dropped dramatically over the three mappings. Talking, low at the beginning, rose to first place by the second period and by the third mapping was over one-fifth of the total activity observed. A possible balance to this emphasis on communication modes is the finding that reading, which was not among the first seven activities on the first mapping, rose to third place (10.4%) at

the second mapping and second place (15%) at the third mapping. Arts and crafts dropped in the second mapping and rose in the third. Traffic, that is, movement to and from places, remained a fairly stable proportion of the total activity, although its rank appeared to drop and rise. This is an important issue in open classes, since moving around is frequently cited as a source of disruption. In fact, from the teacher's view, it may be more conspicious and prominent when there is less diversity of activity and less disruptive where diverse things are going on. How this is perceived by teachers and children needs to be examined more closely. The room in question, larger than most, had a rather even distribution of activity over the room with the corners especially in use. Traffic in this setting could be less disruptive than in smaller rooms.

The room in School B had a much more stable pattern of observed behavior, both in terms of rank and percentages. This class also resembled the overall school pattern. The first four activities maintained a rather stable ranking over the year, covering over 55% of total observed behavior. Note that traffic in this class was lower than that of the other. It is interesting because this room was somewhat smaller and rather crowded with objects and furnishings. Mapping data also indicated the front of this room to be in heavy use, further reducing the space options open to children. The data on furniture arrangements indicate that after the addition of a loft, the room remained essentially set.

The distribution of size of group involved in activities for all rooms over three mappings indicates that individual work was the predominant mode seen. Over one-half of the activities observed had a single child involved

in them. The two-person group size was the second most commonly observed activity unit. These patterns were found in both schools for the three mappings, although specific classes demonstrated more variety than others. Activities in which the groups of 8 or more were involved were least frequently observed, occurring between 1% and 9% of the total time. For the two classes previously described, the predominant single person mode persisted for each, but it was stronger and more consistent in the class from School B. It dropped off in the class in School A with more groups of two and three or over observed in the second and third mappings.

Another dimension to be seen in the patterns of use within classrooms concerns the specific location of teachers. Although teachers differed in overall styles and use of the room there was an overwhelming tendency to concentrate their time in limited locations. When areas were ranked according to the percent of time teachers were observed within them, the first ranked sector revealed a range of 21 to 72%. Further, combining the first three ranks, which accounts for one-quarter of the total area of the room, a range of 47 to 89% was revealed.

Again, looking at specific classrooms illustrates the meaning of the predominant location of the teacher. In one classroom where teacher location was an extreme in the range, that is 72% of time seen in one area, the teacher was never observed in fully one-half of the room's sectors. The teacher's prime location was center front of the room. In this place the teacher led group meetings, group sings, and story time. She then remained there to work with individuals who approached her.

The other end of the range, that is, a teacher seen in a single location a maximum of only 21% of the observations presented a different distribution. In this classroom the teacher was observed in each grid

location at least 3% of the time.

It is interesting that both these situations occurred during the October week of observations close to the beginning of the year, and later mapping weeks (January and May) revealed a more even distribution of teacher's presence, that is the percent of time in one location moved closer to the mean.

Scanning the teacher locations reveals an interesting pattern. Seven of the eight classrooms were structurally similar, that is, doorways, blackboards, windows and closets were in pretty much the same place in each room although arrangements of furniture and equipment differed. Of the twenty-one mappings, the teacher's prime location was in the front of the room for all but one classroom (this one room, the largest, used a moveable blackboard in the rear). Within these rooms front can mean many things, a reflection of past classroom experiences, the opportunity to control access to the door, the proximity of the blackboard to name a few of what appear to be salient issues. Yet a prominent feature of open classrooms is the freedom of mobility offered to teachers. No longer does the blackboard have to function as the primary teaching mode, nor is the teacher's desk the home base. Rather, the individualized and informal use of space is offered to teachers much as to pupils. Despite this, a narrow "home range" is conspicuous for all teachers in the classroom and powerful holdovers in the form of remnants of the traditional room seem to continue to shape use of the space.

Paralleling the view of overall activity is a picture of the activities of teachers (see Table 3). Over all mappings, talking and teaching combined to account for between 39 to 55% of the teacher's time in both schools.

Obviously, the fine line between these two types of activities sometimes was difficult for an observer to distinguish, since all activity involving a teacher might be perceived to have an educational component. However, observers were trained to consider the teacher's behavior as concretely as possible, that is, to code for teaching only where obvious instruction was in evidence. Each instance of teacher/child interaction was to be viewed as closely as possible in terms of what was taking place instead of fitting it into stereotyped roles.

For School A talking and teaching were almost equally balanced. In School B teaching averaged about 27.6% of the teacher's time, over the year, with talking averaging 19%. In addition, an average of 15.6% of teacher time was observed in checking work, a behavior seen only an average of 7.5% in School A. Group meetings involved about 10% of the teacher's time in both schools, and administrative duties about 6% of teacher time.

The activity patterns in the rooms, and ancillary areas (which, it must be added, received minimal use) can be viewed against a brief summary of interview results. Children in both schools reflected on the setting and suggested that there was no place to go for privacy. This was especially strong in School A as was the expressed need for quiet places. In both schools, the request for ways of improving the setting generally elicited ideas for shifting the moveable objects, mainly furniture. Inadequate space and storage were complaints of parents in both schools, a theme of teachers, as well. In addition, teachers added to the list of environmental criticisms the problems of crowding and lack of privacy. These interviews strongly suggest that distribution of people across spaces was at the heart of some of the environmental difficulties encountered.

General Implications

There is a basic question as to how we can apply the varied information on the classrooms we have studied to understand the way settings support, facilitate or obstruct the educational process. The schools in which we have worked consider the setting to be an integral part of open education but all of us, teachers, administrators, researchers, and perhaps the children as well, may question what this really means. We have found relative stability of furnishings in the rooms although there was freedom offered to shift many elements. There was a preponderance of individual work, mainly writing, despite a value expressed for group work. There was uneven use of the room and concentration of teacher's presence in a limited set of sectors, despite the freedom offered to work with a variety of group sizes in a variety of places. We have worked with individual teachers and students on environmental projects and have found serious effort and awareness of many problems although there was sometimes a question as to whether this sensitivity was reflected in their use and arrangements of the classroom space. All of this raises serious questions regarding the meaning of "open" to the teachers and their students, and the kinds of unanticipated problems resulting from use of the room that departs from traditional design-in some ways. What is suggested to us, by our data and our experiences, is the possibility of an open classroom process which proceeds over time, and the fact that we were viewing a segment of that process.

Looking at the classes we have studied over the years, we find the varying open designs communicating many different meanings. In some, the arrangement formed a display, the exposed materials offered to the class perhaps as an invitation, perhaps facilitating access to them. In

other classes decentralized work surfaces were the theme--decentralized in two possible senses, with students de-centered from the traditional desk assignments, given varying degrees of freedom to select their work places or in other cases, specialty areas such as math, science and reading decentralized and arranged over the room. Other rooms were open for what might be an aesthetic or symbolic reason, the arrangement satisfying some ideal conception of what a classroom should look like, and this could relate little or much to what would take place there. Other classes had more informal arrangements of chairs and tables in a plan that moved away from the strict order of a traditional room although many formal, total lessons still took place. Still others were rooms set up with a strong or dominant function--a science, math or reading area. What has been communicated, on many levels, are the varied meanings open takes, for a teacher, the desire to match intentions and physical form, but always in the classes we have studied, an effort to consider space in a more differentiated manner than had been done in the past.

Specific environmental problems have emerged from the use of the rooms. Some were expressed in the interviews, while others were apparent from our intensive observations. One set of problems, seen in the formal observations, interviews and observer impressions, concerned the convergence of children around limited areas variously expressed as crowding, the need for more space, the need for private areas and uneven use of the room. As disparate as these themes may appear, they really are related issues. To the teacher the need for additional space (a comment of teachers whose rooms covered an array of actual dimensions) is understandable, since the teacher was generally in the thick of things, perhaps acting as a magnet, perhaps encouraging this as a means of surveillance and control. The result was

congestion around a set of points anchored by the teacher's presence. Conversely, for the children, there were either limits on freedom to select places, or the available places were inadequate for their purposes. Our knowledge of the rooms suggests that both factors acted to influence children's choices of places to work, with most adequate work surfaces and tables in fact located in or near the teacher zones. There is evidence that an arrangement that allows spacing among children will increase attention to the teacher (Krantz & Risley, 1972). We are only beginning to understand the complex consequences of crowding on social behavior and cognitive tasks (see, for example, Hutt & Vaizey, 1966; McGrew, 1972). One might speculate, further, on the effects of a congested room style on noise level and disruption of work. Observations of individual children in the rooms studied point up some very real difficulties they face in trying to concentrate while surrounded by a mix of bodies and activities. Moreover, the desire for private places expressed by a number of the children and teachers may grow from the overload conditions they experience daily. Interestingly, none of the teachers mentioned uneven use of the room as a problem, and there is some question as to whether they really were aware of this as a source of difficulty. Although even use of any setting seems unreasonable and perhaps undesirable, a room that reserves the major portion of its space for furniture and equipment, using a limited sector for 30 or more moving bodies, seems to be setting the stage for problems to occur.

With respect to an open classroom process, there seems to be an evolution visible in many rooms. The arrangement, at the beginning of the school year, might not reflect a considered decision of what would

seating or desk space was contained within areas. This change of necessity lessened the possibility for whole class lessons and often an area of floor space was set aside for group meetings. In some instances, this area also functioned as the library area when the group was not meeting. As indicated earlier, this group meeting area usually was in the front half of the room and whether on carpet or floor, it provided a large, open space that invited a variety of small group activities. Thus, a chain of circumstances could gradually introduce features that move toward greater variety of individual and group functions.

The image of an open classroom constantly shifting its moveable parts, seems, under most circumstances, to be a very unrealistic view. If other open classrooms operate as the ones we have studied, what seems to happen is a slow process of integrating setting and educational activities. Rapid and radical changes do not happen. We recognize that schools designed with explicitly open spaces may encourage a closer fit between educational intent and setting, although this has yet to be demonstrated.

A major effort of our current research is directed toward identifying the experiences that are likely to enhance environmental awareness and a more reflective use of space in teachers and children. Through informal and formal contacts within the classes we are studying, we hope to move toward a better understanding of environmental supports.

Note

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TABLE 1
RANKS AND PERCENTS OF ACTIVITIES OBSERVED IN THE TWO SCHOOLS OVER THREE MAPPINGS

	School A			School B		
Rank	Mapping I	Mapping II	Mapping III	Mapping I	Mapping II	Mapping III
1	Write (19.9)	Talking (16.5)	Talking (19.5)	Writing (26.1)	Writing (20.7)	Writing (22.7)
2	Talk (13.3)	Writing (13.9)	Reading (10.4)	Arts & Crafts (11.8)	Talking (16.4)	Talking (13.8)
3	Arts & Crafts (12.3)	Traffic (7.8)	Writing (10.4)	Talking (11.3)	Working (13.4)	Arts & Crafts (10.9)
4	Watch act (8.4)	Reading (7.6)	Arts & Crafts (8.9)	Reading (6.3)	Reading (7.5)	Reading (8.0)
5	Traffic (6.3)	Watch act (5.6)	Working (6.5)	Working (5.7)	Arts & Crafts (6.5)	Traffic (8.0)
6	Games-Sit (4.8)	Working (5.5)	Traffic (5.5)	Teaching (5.1)	Traffic (6.4)	Working (6.0)
7	Play (4.8)	Arts & Crafts (5.0)	Watch act (5.3)	Traffic (4.3)	Watch act (4.5)	Look at obj (4.1)

TABLE 2
RANKS AND PERCENTS OF ACTIVITIES OBSERVED IN TWO CLASSROOMS OVER THREE MAPPINGS

	Classroom, School A			Classroom, School B		
Rank	Mapping I	Mapping II	Mapping III	Mapping I	Mapping II	Mapping III
1	Writing (32.0)	Talking (13.5)	Talking (22.9)	Writing (22.7)	Writing (21.3)	Writing (24.4)
2	Traffic (9.8)	Writing (13.0)	Reading (15.0)	Talking (13.1)	Talking (15.4)	Reading (15.4)
3	Arts & Crafts (9.8)	Reading (10.4)	Arts & Crafts (10.8)	Reading (11.2)	Reading (14.7)	Talking (12.3)
4	Talking (9.6)	Working (9.8)	Traffic (8.5)	Arts & Crafts (9.0)	Arts & Crafts (10.2)	Arts & Crafts (9.0)
5	Games-Sit (7.3)	Watch act (8.7)	Writing (6.9)	Watch act (5.9)	Working (5.7)	Traffic (7.0)
6	Watch act (7.3)	Traffic (8.2)	Watch act (5.6)	Working (4.7)	Watch act (4.5)	Working (6.2)
7	Reading (3.8)	Games-Sit (6.7)	Teaching (4.2)	Traffic (4.1)	Traffic (4.3)	Look at obj (4.5)

TABLE 3

PERCENT OF TEACHER ACTIVITY OVER FIRST THREE RANKS FOR BOTH SCHOOLS OVER THREE MAPPINGS

	School A			School B		
	Mapping I	Mapping II	Mapping III	Mapping I	Mapping II	Mapping III
Talk	25.0	19.7	28.2	21.6	19.7	15.7
Teach	23.2	22.7	20.9	23.5	35.7	23.6
Check Work	--	9.8	--	10.5	19.7	16.5
Group Meet	9.8		11.8			

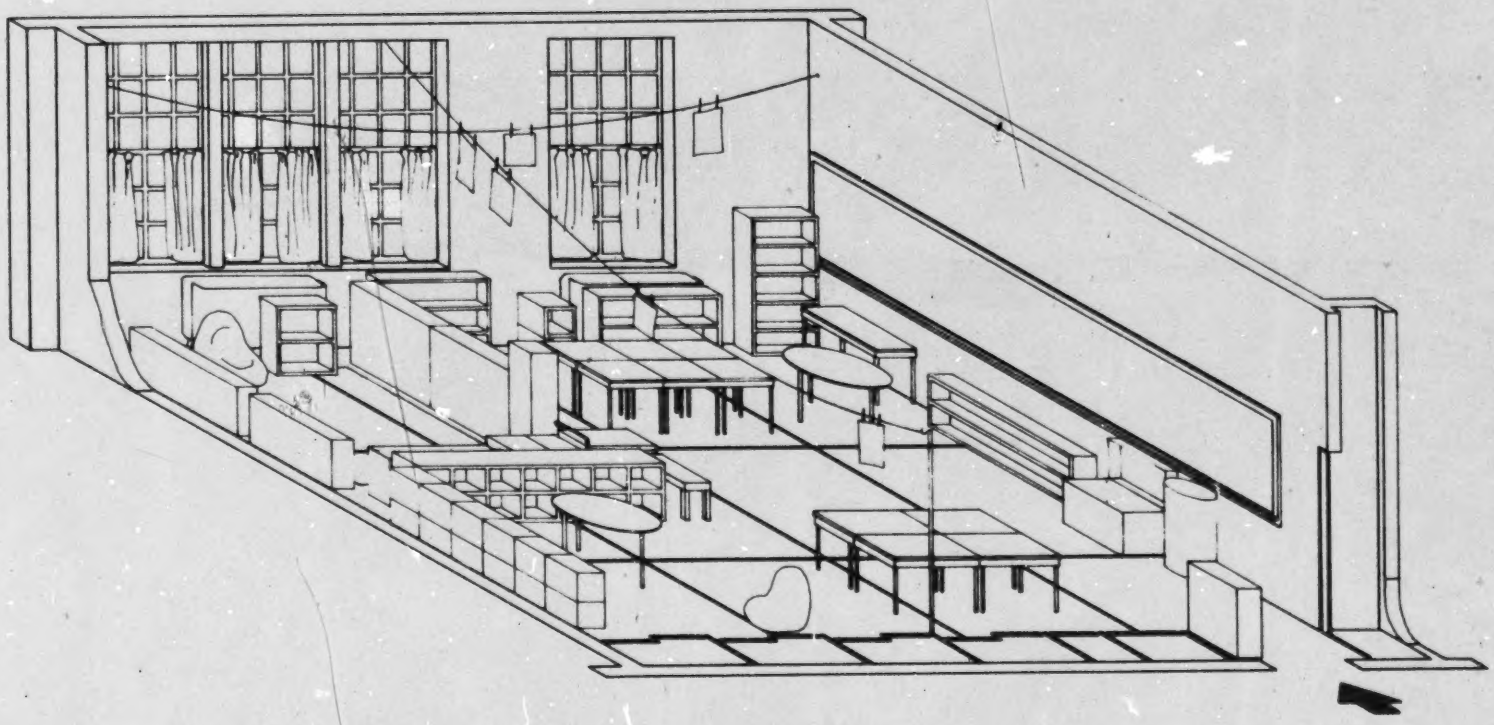

Figure 1 School A
Room 1
Mapping 3

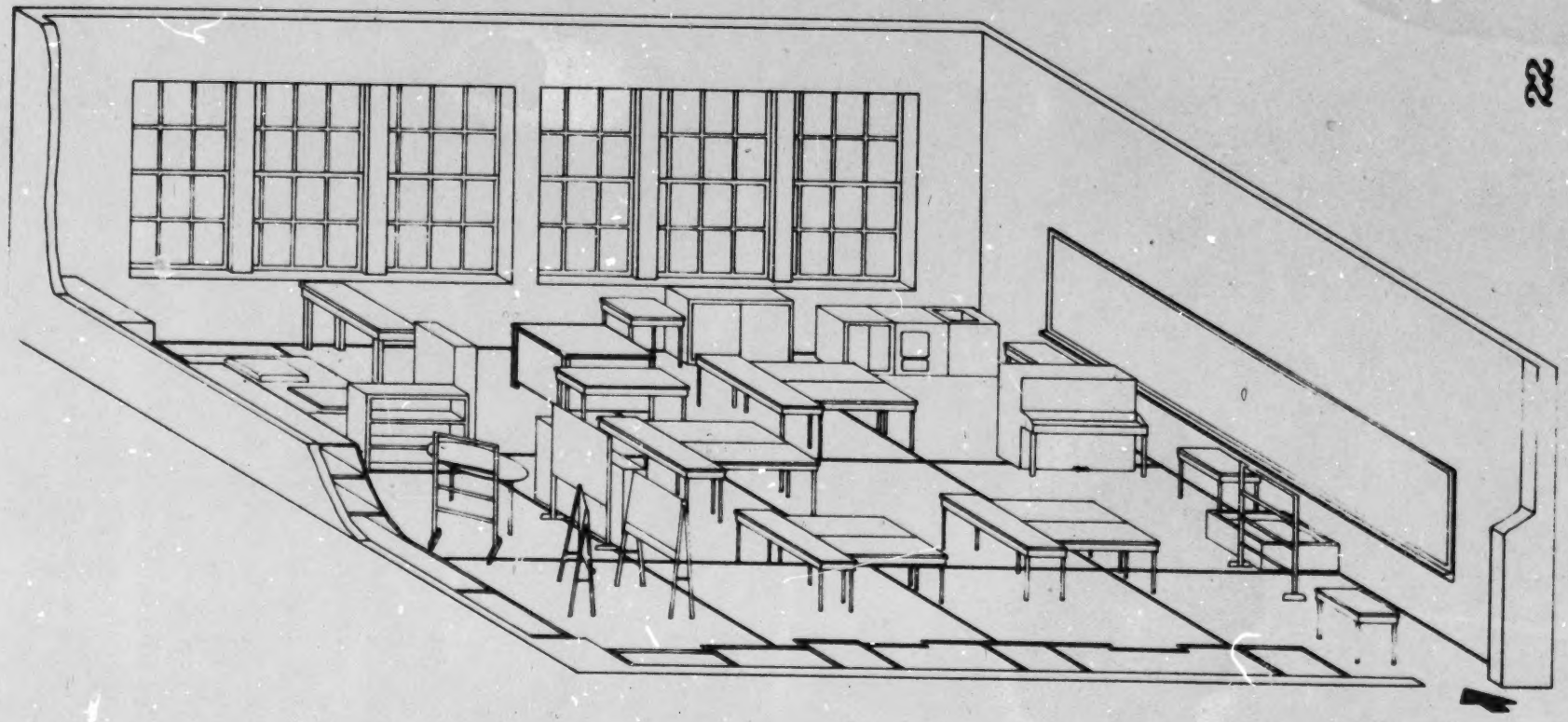

Figure 2 School B
Room 7
Mapping 1

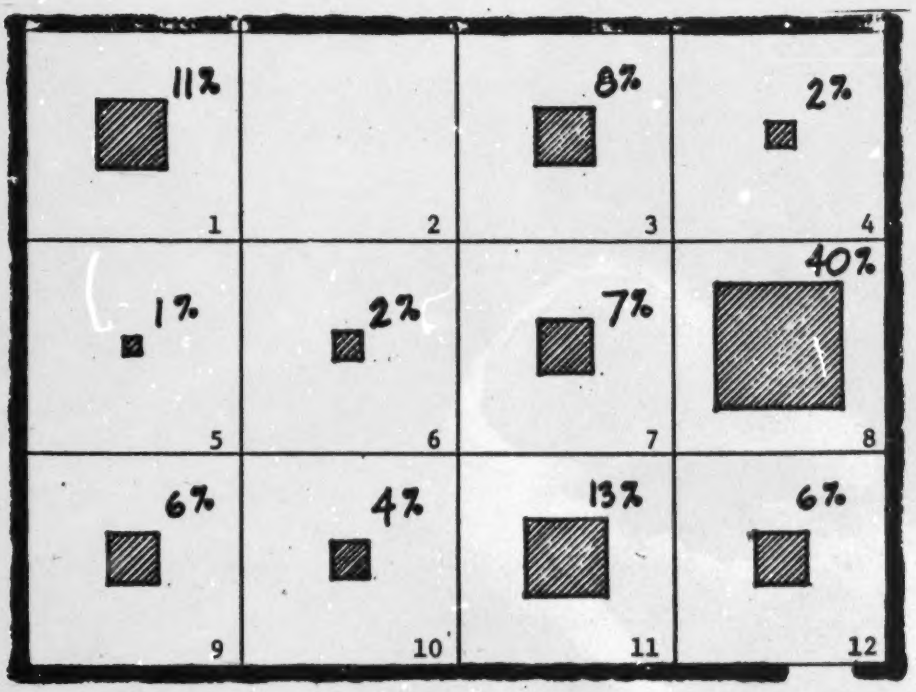

Figure 3 Percent of Observations of Children by Location School A
Room 1
Mapping 3

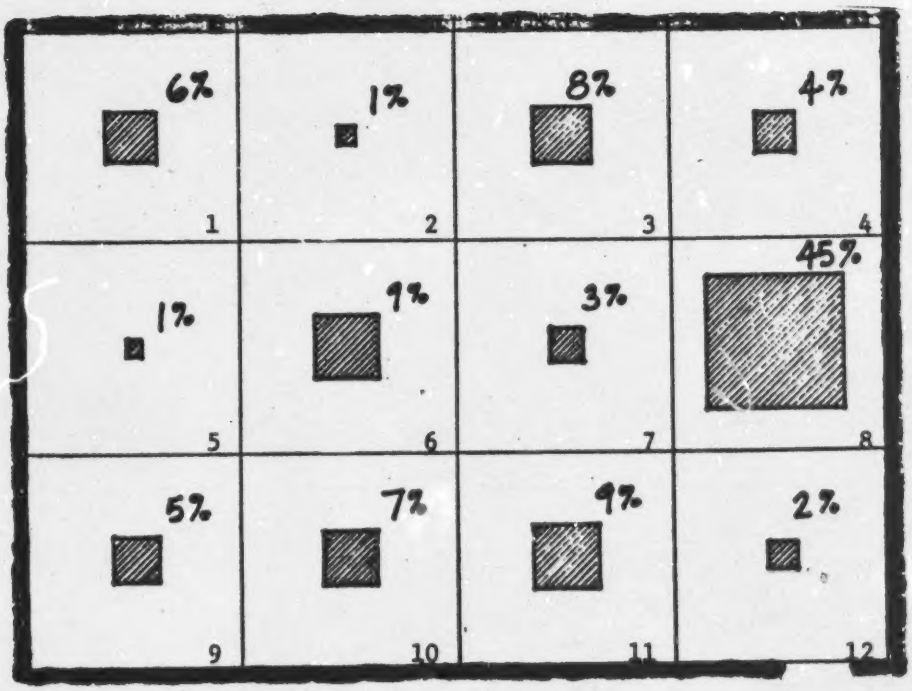

Figure 4 Percent of Observations of Children by Location School B
Room 7
Mapping 1